

NSLS-II Early Science Operations

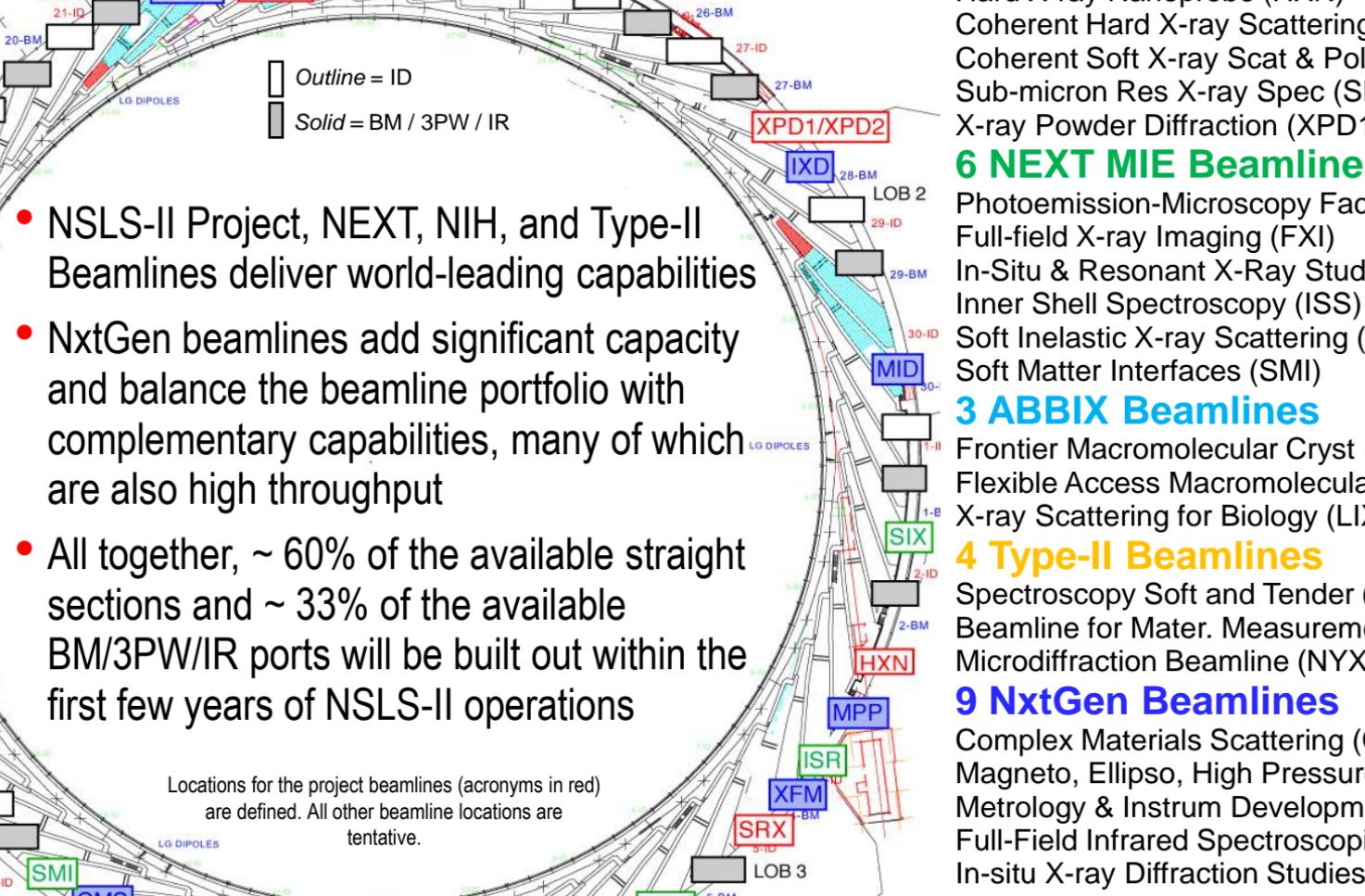


Qun Shen

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2012 NSLS/CFN Users Meeting

May 21-23, 2012



Locations for the project beamlines (acronyms in red) are defined. All other beamline locations are tentative.

8 NSLS-II Project Beamlines

- Inelastic X-ray Scattering (IXS)
- Hard X-ray Nanoprobe (HXN)
- Coherent Hard X-ray Scattering (CHX)
- Coherent Soft X-ray Scat & Pol (CSX1, CSX2)
- Sub-micron Res X-ray Spec (SRX)
- X-ray Powder Diffraction (XPD1, XPD2)

6 NEXT MIE Beamlines

- Photoemission-Microscopy Facility (ESM)
- Full-field X-ray Imaging (FXI)
- In-Situ & Resonant X-Ray Studies (ISR)
- Inner Shell Spectroscopy (ISS)
- Soft Inelastic X-ray Scattering (SIX)
- Soft Matter Interfaces (SMI)

3 ABBIX Beamlines

- Frontier Macromolecular Cryst (FMX)
- Flexible Access Macromolecular Cryst (AMX)
- X-ray Scattering for Biology (LIX)

4 Type-II Beamlines

- Spectroscopy Soft and Tender (SST1, SST2)
- Beamline for Mater. Measurements (BMM)
- Microdiffraction Beamline (NYX)

9 NxtGen Beamlines

- Complex Materials Scattering (CMS)
- Magneto, Ellipso, High Pressure IR (MET/FIS)
- Metrology & Instrum Development (MID)
- Full-Field Infrared Spectroscopic Imaging (IRI)
- In-situ X-ray Diffraction Studies (IXD)
- Materials Physics & Processing (MPP)
- Quick X-ray Absorption Spectroscopy (QAS)
- Tender X-ray Absorption Spectroscopy (TES)
- X-ray Fluorescence Microscopy (XFM)

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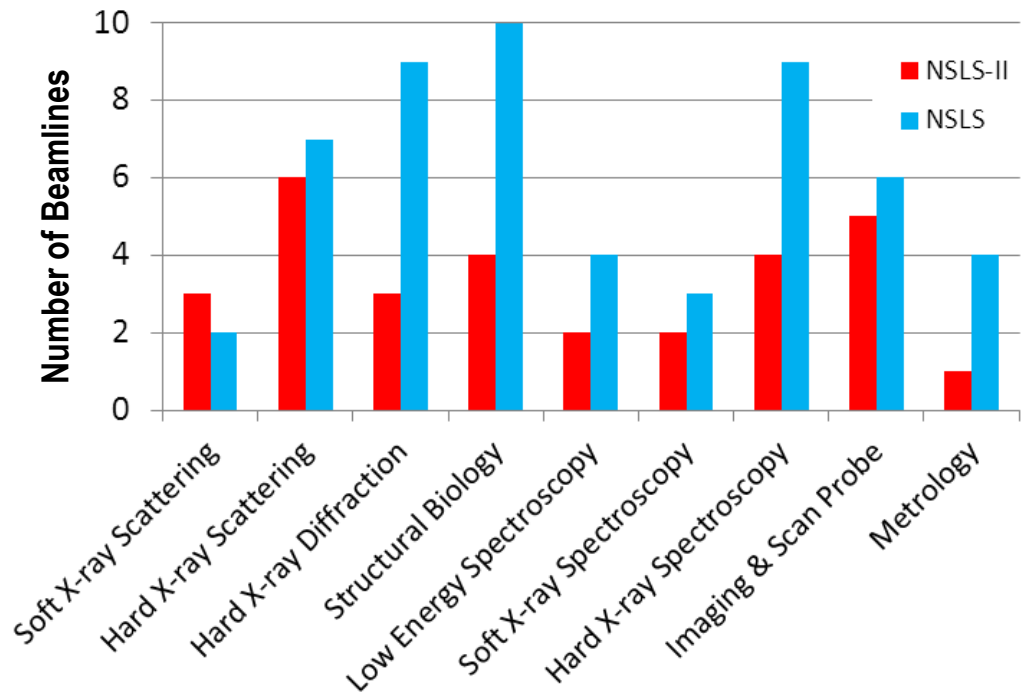
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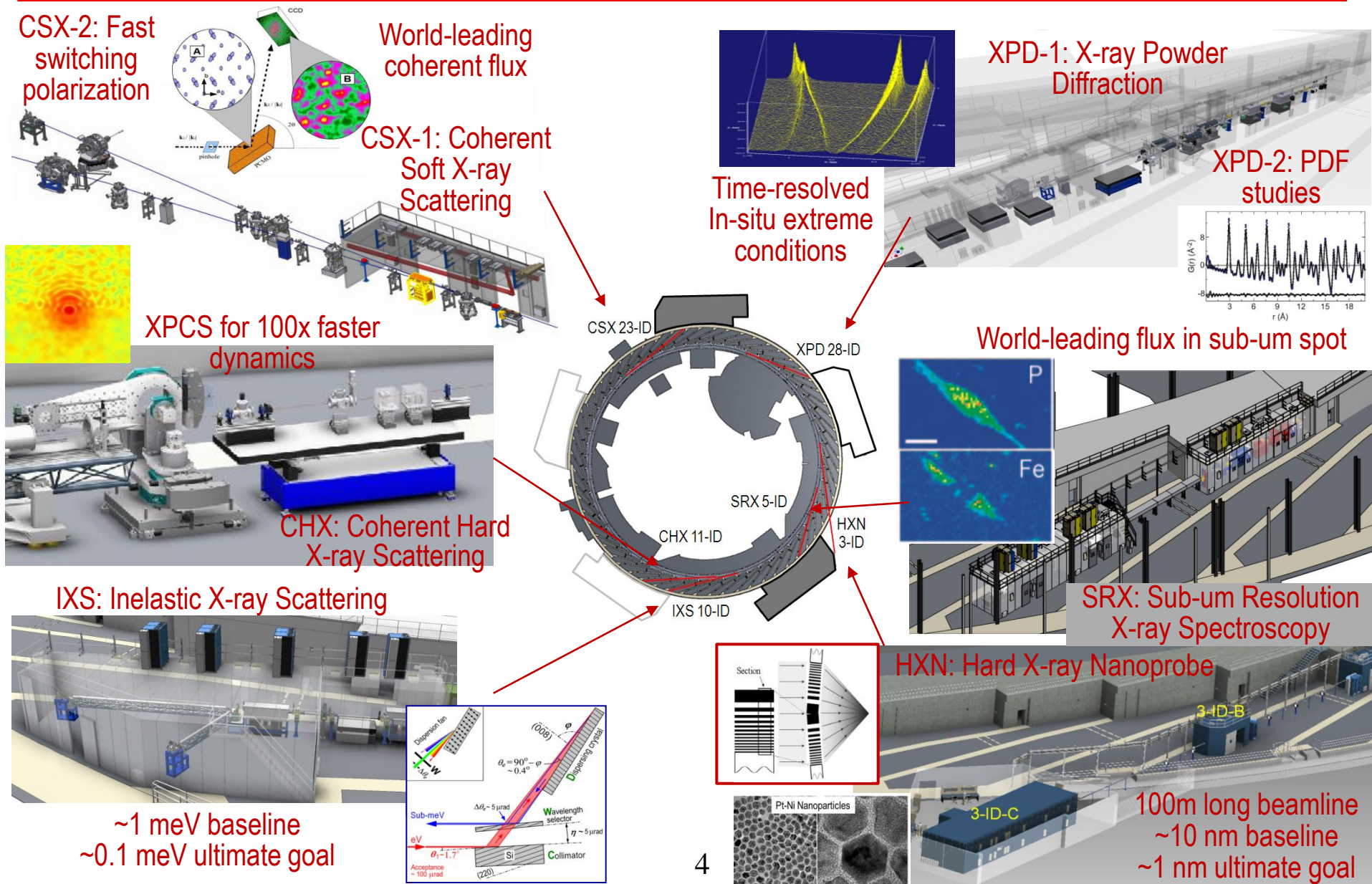
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Early Capacity & Enabling Capabilities

- Comparing to existing NSLS beamlines, the 30 beamlines at NSLS-II will be able to accommodate much of the user capacity in certain technique areas, if these beamlines are given sufficient resources and level of staffing to provide enhanced scientific productivity
- Much enhanced beamline capabilities are expected at NSLS-II beamlines, owing to the exceptional source properties at NSLS-II and advanced instrumentation and optics on NSLS-II beamlines



Eight NSLS-II Project Beamlines – Apr 2014



Assumptions & Basis for Beamline Commissioning

- NSLS-II beamline commissioning follows integrated testing during construction and proceeds in two phases:
 - Technical readiness commissioning and science readiness commissioning
- Integrated testing systematically tests, without beam, all mechanical & control functions of installed beamline subsystems to demonstrate functionality
- Technical Commissioning will focus on beam delivery into the experimental endstation, with emphasis on characterizing the beamline performance parameters, including flux, focus, energy resolution & calibration, energy range, stability, etc...
- Science Commissioning will evaluate the beamline instruments and data acquisition systems for the planned science experiments, and may require measurements on standard systems or calibrated standards, followed by commissioning experiments selected through a review process.

Newly Constructed Beamline Readiness Plan

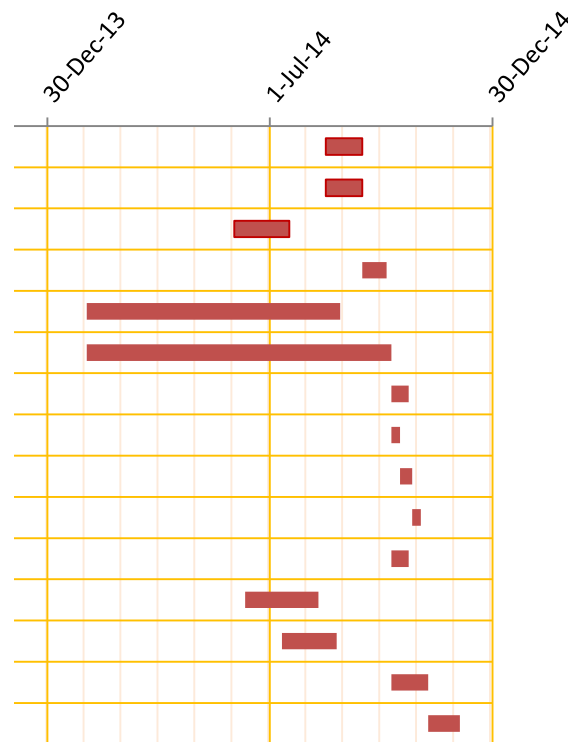
Phase	Integrated Testing (prior to installation complete)	Technical Commissioning (Installation completion plus 0 - 4 months)	Science Commissioning (Technical Readiness plus 0-4 months)
Participants		Staff only	Staff & Commiss'ing Users only
Beamline Readiness Goals	<ul style="list-style-type: none"> • BL shielding verification completed • BL subsystems installed & tested, incl. enclosures, beam transport, PPS & EPS, utilities, and controls • Main optics installed at BL and diagnostic system installed for BL commissioning 	<ul style="list-style-type: none"> • BL shielding verification completed • BL main optics commissioned • Beam properties measured • Endstation installed and commissioned 	<ul style="list-style-type: none"> • Endstation fully characterized for initial science expts • Data acquisition software debugged and functional • Feasibility science expts. performed
Safety and Administrative Approvals	<ul style="list-style-type: none"> • BL safety review & walkthrough • BL readiness technical review (internal) • BL readiness report 	<ul style="list-style-type: none"> • BL shielding certified • BL user access & safety procedure implemented • BL commissioning report 	<ul style="list-style-type: none"> • Approval for BL user operations

- Beamline enters user program following science commissioning

NxtGen Beamline Relocation & Readiness Schedule

Under Development

	Start	End	Duration
3-pole Wiggler Installation	16-Aug-14 -	15-Sep-14	30
Front End Installation	16-Aug-14 -	15-Sep-14	30
First Hutch Installation	2-Jun-14 -	17-Jul-14	45
Hutch Shielding tests	15-Sep-14 -	5-Oct-14	20
Experiment Hutch Relocation	1-Feb-14 -	28-Aug-14	208
Beamline Relocation	1-Feb-14 -	9-Oct-14	250
Vacuum testing	9-Oct-14 -	23-Oct-14	14
Controls testing	9-Oct-14 -	16-Oct-14	7
Monochromator testing	16-Oct-14 -	26-Oct-14	10
Mirror System Testing	26-Oct-14 -	2-Nov-14	7
Diagnostics	9-Oct-14 -	23-Oct-14	14
PSS	11-Jun-14 -	10-Aug-14	60
EPS	11-Jul-14 -	25-Aug-14	45
End Station Equipment tests	9-Oct-14	8-Nov-14	30
First Science Experiment	8-Nov-14	4-Dec-14	26



- Beamline relocation includes hutch shielding testing
- NxtGen beamline PSS, EPS, and installation tasks staggered for load-leveling
- Technical commissioning duration approximately 1 – 2 months for relocated beamlines

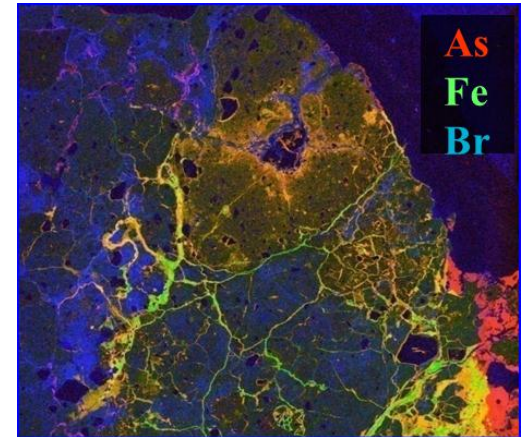
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Early Science Development Process

- Work with the user community to identify and develop the exciting science that will be done in the first experiments at the beamlines
- Achieve a fast ramp-up of the science program at NSLS-II by having key experiments fully developed and ready for beam when beamline commissioning begins in FY14
- Development process consists of the following steps:
 - Scientific Planning Workshops
 - White Papers on Early Science and Beamline Capabilities Analysis
 - Call for NSLS-II First Experiments Proposals
 - Scientific Peer-Review of First Experiments Proposals
 - Selection of First Experiments and Associated Experimental Teams
 - Pre-Operation Development of the Selected First Experiments
 - Periodic Progress Discussion Meetings for Approved First Experiments
 - Starting to Conduct First Experiments at NSLS-II Beamlines



Scientific Planning Workshops

- Scientific Planning Workshops
 - Update the user community on the progress and plans for NSLS-II (including beamline capabilities and the schedule for transition to operations)
 - Reassess the scientific challenges and opportunities for which NSLS-II is best suited and update conclusions from 2008 workshops
 - Identify key first experiments that may be conducted at the initial suite of NSLS-II beamlines, emphasizing ones that take advantage of NSLS-II properties
 - Facilitate the formation of teams to generate proposals for first experiments for subsequent peer-review
 - Recommend priorities for future beamline development based on identified key capabilities that are currently absent among the current suite of NSLS-II beamlines under development
 - Summarize the workshop findings in a White Paper
 - These workshops will be followed by a call for proposals for “first experiments” and will also serve as a guide to future calls for Beamline Development Proposals
- Possible Science Themes:
 - Condensed Matter Physics
 - Soft Matter and Dynamics
 - Materials Science & Nano-Materials
 - Earth and Environmental Sciences
 - Catalysis and Chemical Sciences
 - Life and Biomedical Sciences
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